# OPERATING SYSTEMS SYLLABUS

## Module 1: Introduction

- Introduction to OS: Functionality of OS
- OS design issues
- Structuring methods: monolithic, layered, modular, micro-kernel models
- Abstractions, processes, resources
- Influence of security, networking, and multimedia

## Module 2: OS Principles

- System calls, System/Application Call Interface
- Protection: User/Kernel modes
- Interrupts
- Process Structures (Process Control Block, Ready List, etc.)
- Process creation and management in Unix
- Threads: User level, kernel level threads, and thread models

## Module 3: Scheduling

- Process scheduling
- CPU scheduling: Pre-emptive and non-pre-emptive
- Multiprocessor scheduling
- Deadlocks
- Resource allocation and management mechanisms: prevention, avoidance, detection, recovery
- Deadlock handling

# Module 4: Concurrency

- Inter-process communication, Synchronization
- Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware)
- Semaphores
- Classical synchronization problems
- Monitors: Solution to Dining Philosophers problem
- IPC in Unix
- Multiprocessors and locking
- Scalable locks
- Lock-free coordination

# Module 5: Memory Management

- Main memory management
- Memory allocation strategies
- Virtual memory: Hardware support for virtual memory (caching, TLB)
- Paging, Segmentation
- Demand paging
- Page faults, Page replacement
- Thrashing, Working set

# Module 6: Virtualization and File System Management

- Virtual Machines
- Virtualization: Hardware/Software, Server, Service, Network
- Hypervisors, Container virtualization
- Cost of virtualization
- File system interface (access methods, directory structures)
- File system implementation (directory implementation, file allocation methods)
- File system recovery
- Journaling, Soft updates, Log-structured file system
- Distributed file system

## Module 7: Storage Management, Protection, and Security

- Disk structure and attachment
- Disk scheduling algorithms (seek time, rotational latency based)
- System threats and security
- Policy vs. mechanism
- Access vs. authentication
- System protection: Access matrix, Capability-based systems
- OS performance and scaling
- Future directions in mobile OS